

**IN THE CLAIMS:**

- 1 1. (Previously Presented) A method for integrating traffic shaping and link sharing func-  
2 tions to enable scaling of a plurality of queues multiplexed to media links of an interme-  
3 diate station in a computer network, the queues storing data packets that are destined for  
4 the media links, the method comprising the steps of:  
5       assigning committed information bit rate (CIR) and excess information bit rate  
6 (EIR) bandwidth values per queue, along with a shaped maximum bit rate per media link;  
7       uniformly scaling the EIR bandwidths of all queues sharing a media link so that  
8 the sum of all scaled EIR bandwidths equals an available bandwidth of the shaped media  
9 link;  
10       calculating when a queue is next eligible for servicing; and  
11       storing event notifications in a timing wheel having hash entries identifying a  
12 queue, a media link, and a priority, the event notifications are triggered when a queue is  
13 eligible for servicing.
- 1 2. (Original) The method of Claim 1 wherein the step of storing comprises the step of  
2 providing a timing wheel having a plurality of fields per time slot, wherein the fields rep-  
3 resent different service priorities of queues.
- 1 3. (Currently Amended) The method of Claim 2 wherein the step of providing a timing  
2 wheel comprises the step of configuring pointers to the queues ~~to enable early forwarding~~  
3 ~~of the packets~~ to thereby obviate overhead incurred when searching the timing wheel for  
4 other references to the packets.
- 1 4. (Original) The method of Claim 3 wherein the step of providing a timing wheel fur-  
2 ther comprises organizing the timing wheel as a contiguous array of time slots containing  
3 pointers to linked lists.

1 5. (Original) The method of Claim 4 wherein the contiguous array is a hash array and  
2 wherein the linked lists are hash lists.

1 6. (Original) The method of Claim 3 wherein the step of providing a timing wheel fur-  
2 ther comprises organizing the timing wheel as a descriptor ring having a plurality of per-  
3 time-slot queues.

1 7. (Original) A system for integrating traffic shaping and link sharing functions to enable  
2 scaling of a plurality of queues multiplexed to media links of an intermediate station in a  
3 computer network, the queues storing data packets that are destined for the media links,  
4 the system comprising:

5 queuing logic configured to organize the queues into class queues of a plurality of  
6 queue sets, each queue set coupled to inputs of a sublink multiplexer having an output  
7 coupled to a media link via a media link queue; and

8 a queue scheduler configured to assign each class queue committed information  
9 bit rate (CIR) and excess information bit rate (EIR) bandwidths, and the media link a  
10 shaped maximum bit rate.

1 8. (Original) The system of Claim 7 wherein the queue scheduler comprises a EIR scaler  
2 that uniformly scales the EIR bandwidths of all queues sharing a media link so that the  
3 sum of all scaled EIR bandwidths equals an available bandwidth of the shaped media  
4 link.

1 9. (Original) The system of Claim 8 wherein the queue scheduler further comprises a vir-  
2 tual time policer (VTP) configured to determine whether the media links are compliant  
3 and to calculate when a queue is next eligible for servicing.

- 1 10. (Original) The system of Claim 9 wherein the queue scheduler further comprises a  
2 timing wheel for storing event notifications that are triggered when a queue is eligible for  
3 servicing.
- 1 11. (Original) The system of Claim 10 wherein the timing wheel is organized as a con-  
2 tiguous array of time slots containing pointers to linked lists, wherein each list contains a  
3 plurality of entries of queue descriptors.
- 1 12. (Original) The system of Claim 11 wherein the queue descriptors include a queue  
2 index that references a class queue of the queuing logic.
- 1 13. (Original) The system of Claim 12 wherein the queue descriptors include a media  
2 link interface that references a media link coupled to the intermediate station.
- 1 14. (Original) The system of Claim 12 wherein the queue descriptors include a priority  
2 value indicating a priority level assigned to a queue.
- 1 15. (Original) The system of Claim 10 wherein the timing is organized as a descriptor  
2 ring having a plurality of per-time-slot queues.
- 1 16. (Original) The system of Claim 15 wherein the descriptor ring comprises an array of  
2 time slots, wherein each slot contains a queue-depth index that references a tail of a list of  
3 descriptors.
- 1 17. (Original) A method for integrating traffic shaping and link sharing functions to en-  
2 able scaling of a plurality of queues multiplexed to media links of an intermediate station  
3 in a computer network, the queues storing data packets that are destined for the media  
4 links, the method comprising the steps of:  
5 notifying a queue scheduler when each packet is forwarded to a queue;

6           determining if the queue is inactive for a committed information bit rate (CIR)  
7   and for an excess information bit rate (EIR);  
8           if the queue is inactive for the CIR, activating the CIR and incrementing an ag-  
9   gregate CIR bandwidth for a media link;  
10          if the queue is not inactive for the CIR, activating the EIR rate and incrementing  
11   the aggregate EIR bandwidth for the link; and  
12          calculating an EIR scale factor of the link.

1   18. (Currently Amended) The method of Claim 17 further comprising the steps of:  
2          retrieving a queue descriptor from ~~the~~ a timing wheel, wherein the queue descrip-  
3   tor includes a queue index, a media link interface , and a priority value;  
4          comparing a calculated link VTP timestamp of a media link queue with a current  
5   real time and burst value to ensure that collisions between an eligible queue and other  
6   queues do not cause the media link queue to exceed a configurable limit;  
7          if the media link queue does not exceed the configurable limit, issuing a dequeue  
8   command to the queuing logic for the eligible queue;  
9          in response to the command, dequeuing a packet from the eligible queue;  
10          returning a length of the dequeued packet as dequeue status to the queue sched-  
11   uler; and  
12          if the queue length is non-zero, sending the dequeued packet to a media controller  
13   for loading into the media link queue.

1   19. (Original) The method of Claim 18 further comprising the steps of:  
2          periodically sending depth threshold status of the media link queue to the queue  
3   scheduler;  
4          if the depth threshold status indicates that there are more bits in the media link  
5   queue than the link VTP timestamp represents, incrementing the link VTP timestamp;  
6          correlating the dequeue status with the issued dequeue command;  
7          if a dequeued byte count is non-zero, marking the queue as eligible for servicing;

8 if the dequeued byte count is zero, deactivating one of the CIR and EIR of the  
9 queue; and  
10 decrementing one of the CIR and EIR aggregate bandwidths of the link.

1 20. (Cancelled)

1 21. (Previously Presented) A method for operating an intermediate station, comprising:  
2 dividing the intermediate station into a plurality of queues multiplexed to a plural-  
3 ity of media links, the queues storing data packets that are destined for the media links;  
4 storing event notifications in a plurality of time slots within a timing wheel when  
5 a queue is eligible for servicing, where each time slot in the plurality of time slots in-  
6 cludes a hashed entry, the hashed entry identifying a queue index (Q), a media link inter-  
7 face (I), and a priority value (P) for each queue; and  
8 upon a timing slot in the plurality of time slots becoming current time, checking  
9 each entry in a list associated with the time slot, to determine which packets to send.

1 22. (Previously Presented) The method of Claim 21 further comprising:  
2 storing similar entries for the same queue at a first time and a second time, where  
3 the second time is further in the future than the first time, and an entry at the second time  
4 is a higher priority than an entry at the first time.

1 23. (Previously Presented) An intermediate station, comprising:  
2 a scheduler with timing slots; and  
3 one or more entries within the timing slots, where the entries are hashed entries  
4 of identifying a queue index (Q), a media link interface (I), and a priority value (P), and  
5 point to a media port and a queue.